

Livestock flies - sw

Dr. Bushland

APR 16 1956

P. O. Box 3391
Orlando, Florida
April 13, 1956

AIRMAIL

To: A. W. Lindquist, Head, Insects Affecting Man and Animals
Section, Plant Industry Station, Beltsville, Maryland

From: C. L. Smith

Subject: Preliminary Statement on Methods and Costs of a
Screw-worm Eradication Program.

In response to the request in your letter of April 6, to Dr. Bushland, attached hereto are statements prepared by Messrs. Baumhover and Graham regarding certain phases of the screw-worm eradication program. Based on their experience in actual production, I feel that their opinions are worthy of serious consideration.

The three of us have gone over the proposed plan and budget and discussed it almost item for item, and though the cost figures seem astronomical and we were unable to reconcile all of the personnel in detail in the final program, we do feel that the plan is workable. We are also agreed that in a program so immense, in spite of careful planning some items may be overlooked. The overall program should be flexible enough and have sufficient funds to take care of such situations.

Item 1. Supervising personnel.--At first glance it would appear that this item might be "top heavy", but considering the numerous activities involved in the overall program, we would hesitate to consider a reduction.

Item 2. Larval rearing.--Other than the cost of the media and the disposal system, the remaining parts are not questioned. Since our experience has been that the young larvae did not thrive on beef heart as well as on ground beef, we would hesitate to reduce the cost to your figure. We do not see the need for a disposal plant for spent media since it could be converted to fertilizer and a few escaping larvae in Texas would not make too much difference.

Item 3. Fly dispersal.--Mr. Baumhover has covered this phase rather thoroughly and has shown that part "a" might be greatly reduced, but this item is miles and not acres.

Item 4. Field survey personnel.--We are in agreement that 20 survey personnel may be too low in that one man could not thoroughly cover three counties--in some instances, yes, but in many he could not. If the number of personnel is too low there would be a corresponding discrepancy in the other cost figures. How about microscopes and/or other equipment for the personnel?

(In duplicate)
Enclosures (2)
cc: R. C. Bushland

Item 1. Field survey personnel.--We are in agreement that 20 survey personnel may be too low in that one man could not thoroughly cover three counties--in some instances, yes, but in many he could not. If the number of personnel is too low there would be a corresponding decrease in the other costs likewise. How about telephones and other equipment for the personnel?

(In duplicate)
Buckner (3)
C. E. Buckner

April 13, 1956

Larval Rearing - A. J. Graham

Past experience indicates that 50,000,000 square feet of floor space would be required to rear 50,000,000 larvae per week. The space requirements will vary some depending on whether new cultures are started daily or every two or three days. Starting new cultures daily would require less space. It appears that there would be some saving in manpower and equipment if all the rearing was done at a single hatchery. The \$500,000.00 estimate seems adequate for the type of building needed.

It is difficult to estimate the cost of equipment until these needs are actually determined. It is considered that \$300,000.00 for equipment is a conservative estimate. The estimate of manpower for rearing and colony maintenance seems adequate.

The estimated cost of the larval-rearing-medium with beef heart in the finishing product is 40¢ instead of 25¢ per 1,000 larvae. Beef heart contains approximately 18 percent fat, therefore would require some processing to be within the 10-12 percent fat maximum. It seems that the loss from trimming plus the cost of processing would increase the cost to about 20¢ per pound, rather than 15¢ per pound.

Research has been directed toward cheapening the finishing medium only. A few preliminary tests indicated that a beef heart medium did not get the young larvae off to as good start as a medium of lean ground

April 13, 1956

Harvey Kassar - A. L. Graham

Best experience indicated that 25,000,000 eggs per year of space would be required to rear 25,000,000 larvae per year. The space requirements will vary some depending on whether new cultures are started daily or every two or three days. Starting new cultures daily would require less space. It appears that there would be some saving in manpower and equipment if all the rearing was done at a single hatchery. The \$200,000.00 estimate seems adequate for the type of building needed.

It is difficult to estimate the cost of equipment until these needs are actually determined. It is considered that \$300,000.00 for equipment is a conservative estimate. The estimate of manpower for rearing and colony maintenance seems adequate.

The estimated cost of the larval-rearing-medium with beef heart in the finishing product is 10¢ instead of 15¢ per 1,000 larvae. Beef heart contains approximately 18 percent fat, therefore would require some processing to be within the 10-12 percent fat maximum. It seems that the loss from trimming plus the cost of processing would increase the cost to about 20¢ per pound, rather than 15¢ per pound.

Research has been directed toward cheapening the finishing medium only. A few preliminary tests indicated that a beef heart medium did not let the young larvae off to as good start as a medium of lean ground

beef. The meat requirement for rearing 1,000 larvae is 1/2 pound in the starting medium and one pound in the finishing medium. The 40¢ per 1,000 larvae is based on using only lean beef in the starting medium and only beef heart in the finishing medium. The cost per 1,000 larvae using only lean beef at 39 1/2¢ per pound is about 60¢. There is a possibility of lowering the rearing cost by combining cheap fish with either lean beef or heart.

The annual cost of the media at 40¢ per 1,000 larvae is \$1,040,000.00.

Time and Space Intervals of Sterile Male
Screw-worm Releases, Curacao, 1954 - A. H. Baumhover

Sterile screw-worm fly releases on Curacao were scheduled twice weekly at mile intervals, alternating the flight lanes to effect half-mile swaths weekly. Except for the period of June 8 to July 11, 1954 when no flies were released and the first two weeks of release, this schedule was followed with a variation of no more than two or three days. Delays encountered were caused by the following factors listed in order of importance:

A. Failure of flies to arrive on schedule due to--

1. Rearing difficulties.
2. Delay enroute (infrequent).

best. The new requirement for testing 1,000 larvae is $1/2$ pound in the starting medium and one pound in the finishing medium. The cost per 1,000 larvae is based on using only lean beef in the starting medium and only beef heart in the finishing medium. The cost per 1,000 larvae using only lean beef at $39 1/2$ ¢ per pound is about 60¢. There is a possibility of lowering the testing cost by combining cheap fish with either lean beef or heart.

The annual cost of the media at 10¢ per 1,000 larvae is

\$1,000,000.00.

Time and Space Intervals of Sterile Flies
Soren-vorn Kalsen, Curacao, 1954 - A. H. Karsch

Sterile curacao flies released on Curacao were scheduled twice weekly at nine intervals, alternating the flight times to effect half-also weekly. Except for the period of June 8 to July 11, 1954 when no flies were released and the first two weeks of release, this schedule was followed with a variation of no more than two or three days. Delay encountered were caused by the following factors listed in order of importance: 1. Failure of flies to arrive on schedule due to--

1. Hearing difficulties.
2. Delay enroute (intermittent).

B. Lack of flying facilities due to--

1. No pilot.
2. No plane operative.
3. Unfavorable weather (1 release by auto).

Variations in numbers of released flies per week were caused primarily by the variation in size of the shipments. During the first 12 weeks of release the weekly average number per square mile varied from 49 to 200. Beginning with the fourth week after releases began (April 7 to 13) sterility of egg masses ranged from 12.8% to 20.7% with a 4% to 6% increase in sterility occurring within this range on two occasions when the weekly rate was 200 sterile males.

During the 5-week period (June 8 to July 12) when no releases were made, sterility of the egg masses collected declined only to 7.2%, while the weekly average of egg-mass collections per pen declined from 21.3 to 11.7. Apparently the number of sterile males surviving from the previous releases, along with natural factors unfavorable to the screw-worm, were successful in causing the downward trend in the population. The carryover of sterility during this period indicates that the intervals between releases might be increased to one week or more. In addition, current laboratory data indicate that 50% of non-irradiated males from strains now being reared and mated in the laboratory with 20 or more females (and fertilizing as high as 17), were living two weeks at 80° F. Since irradiation at 7,500 r does not seriously reduce longevity,

8. Lack of flying facilities due to--
1. No flight.
2. No plane operative.
3. Unfavorable weather (1 release by auto).
Variations in number of released flies per week were caused primarily by the variation in size of the shipments. During the first 12 weeks of release the weekly average number per shipment varied from 19 to 200. Beginning with the fourth week after release began (April 7 to 12) sterility of egg masses ranged from 12.8% to 20.7% with a 1% to 6% increase in sterility occurring within this range on two occasions when the weekly rate was 200 sterile males.
During the 5-week period (June 8 to July 12) when no releases were made, sterility of the egg masses collected declined only to 7.2%, while the weekly average of egg-mass collections per pen declined from 21.7 to 11.7. Apparently the number of sterile males surviving from the previous releases, along with natural factors unfavorable to the worms, were successful in causing the downward trend in the population. The carryover of sterility during this period indicates that the interval between releases might be increased to one week or more. In addition, current laboratory data indicate that 50% of non-irradiated males from strains now being reared and used in the laboratory with 20 or more females (and fertilizing as high as 17), were living two weeks at 80° F. Since irradiation at 7,500 r does not seriously reduce longevity,

weekly releases of 400 per square mile could possibly produce a static population of 1,000 per square mile at the end of four weeks:

			A 100	
		A 200	B 200	(Numbers remaining alive at indicated week)
	A 300	B 300	C 300	
A 400	B 400	C 400	D 400	
1	2	3	4	
Weeks				

Although mortality at three weeks may be higher than 75%, the mortality at the end of the first week would be less than 5%.

Accuracy of Flight Lanes:

Except on two or three occasions flight lanes on Curacao were flown accurately. Usually skilled pilots were available, who could navigate readily by the numerous landmarks. An altitude of 400 to 500 feet above the terrain was usually maintained, although an altitude of 1,000 feet would have been safer for the personnel and the landmarks more readily observed.

Increasing Swath Width:

Since the Curacao project was set up with maximum requirements for success, it seems very likely that swath width could be increased from one mile to two miles or more. Unfortunately our data on fly dispersal is very meager. However, following the release of 3,700 animal-reared screw-worms (tagged with P-32) September 24, 1953, during the Trenton study, 75 egg masses were collected 3/8 mile from the release site compared to only two at a pen 1 3/4 mile from the release site. Nevertheless

weekly releases of 100 per square mile could possibly produce a stable population of 1,000 per square mile at the end of four weeks:

Weeks	1				2				3				4			
	A 100	B 100	C 100	D 100	A 200	B 200	C 200	D 200	A 300	B 300	C 300	D 300	A 400	B 400	C 400	D 400
Members remaining alive at indicated week																

Although mortality at three weeks may be higher than 75%, the mortality at the end of the first week would be less than 5%.

Accuracy of Flight Data:

Except on two or three occasions flight data on Guncos were flown accurately. Usually killed birds were available, who could navigate readily by the numerous landmarks. An altitude of 100 to 200 feet above the terrain was usually maintained, although an altitude of 1,000 feet would have been safer for the personnel and the landmarks more readily observed.

Increasing Death Width:

Since the Guncos project was set up with maximum requirements for success, it seems very likely that death width could be increased from one mile to two miles or more. Unfortunately our data on fly dispersal is very meager. However, following the release of 3,700 and well-trained screw-worms (tagged with T-38) September 24, 1953, during the Truman study, 75 egg masses were collected 3 1/2 miles from the release site compared to only two at a point 1 3/4 miles from the release site. Nevertheless

the area represented by a radius of $1 \frac{3}{4}$ mile is 22 times as large as an area of $\frac{3}{8}$ mile radius making the expected collection at the far pen 3.4 masses if the flies had dispersed uniformly.

Increasing the swath width to two miles (maximum dispersal required for even distribution one mile, or $\frac{1}{2}$ mile if flight lanes alternated every week) and making flights once a week would reduce the weekly cost of dispersion to 25% of the figure based on Curacao distribution. Each flight mile would cover two square miles, thus

$$\frac{50,000 \text{ acres}}{2} = 25,000 \text{ flight miles; } \frac{25,000}{100 \text{ (mph)}} = 250 \text{ hrs.};$$

$$250 \text{ hrs.} \times \$10.00 = \$2,500.00/\text{wk. plus } 1/5 \text{ added for ferrying} = \$3,000.00/\text{wk. or } \$156,000.00/\text{yr.}$$

Handling of Release Containers:

It is suggested that if at all possible the release containers be placed in panels or racks containing 100 or more containers in one or two layers to remain there during the entire manipulation to avoid individual handling. A feeding device could be designed to care for each rack in a single operation.

the area represented by a radius of $1\frac{1}{2}$ mile is 22 times as large as an area of $\frac{1}{2}$ mile radius making the expected collection at the far per 3.4 masses if the flies had dispersed uniformly.

Increasing the swath width to two miles (maximum dispersal required for even distribution one mile, or $1\frac{1}{2}$ mile if flight lanes alternated every week) and making flights once a week would reduce the weekly cost of dispersion to 25% of the figure based on Caracas distribution. Each flight mile would cover two square miles, thus

$$\frac{20,000 \text{ acres} = 25,000 \text{ flight miles; } 25,000 \text{ hrs.}}{100 \text{ (mph)}}$$

$$250 \text{ hrs.} \times \$10.00 = \$2,500.00/\text{wk. plus } 1/2 \text{ added for ferrying} = \$3,000.00/\text{wk. or } \$150,000.00/\text{yr.}$$

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